DOCUMENT RESUME

ED 180 023 CS 502 734

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TITLE Current Developments and Trends in Videotex and Teletext.
PUB DATE Sep 79
NOTE 16p.; Paper presented at the Annual Meeting of the International Institute of Communication (London, England, September 9-13, 1979)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Communications; *Delivery Systems; Foreign Countries; Information Services; *Information Sources; Information Utilization; Mass Media; *Media Technology; Publishing Industry; *Telecommunication; *Telephone Communication Systems

ABSTRACT

The major developments in videotex and teletext throughout the world are reviewed and the impact these developments are likely to have on the future of electronic publishing media is analyzed in this paper. Various sections of the paper provide discussions of the following: the terminology of the new field; implementation of videotex/teletext services; global trends in videotex, including the use of Prestel, technical trends, and problems and unknowns; and international reactions to videotex/teletext, emphasizing the carriers, the manufacturers, the information (service) providers, and the users. (FL)

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ED180023

IIC Annual Conference 1979 London 9 - 13 September

Current Developments and Trends

In Videotex and Teletext

A Background Paper

prepared by

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Contribution to Plenary Session

Monday, 10 September 14:30-16:00

CS 502 734

1. INTRODUCTION

As pioneers in the field of videotex and teletext, Britain has been responsible for a new phenomenon which is spreading rapidly throughout the world - 'Prestel-watching'. Many of the current developments in 'electronic publishing' depend heavily upon the pioneering example of the British Post Office (BPO) Prestel system. Its technical standards have had an immense impact on the world market, but they are by no means universally accepted: the BPO's system design has been imitated, but alternative methods of operation are also being explored.

This paper reviews the major developments in videotex and teletext throughout the world and analyzes the impact these developments are likely to have on the future of electronic publishing media in general.

2. TERMINOLOGY

Before going any further it is essential to clarify terminology: as in any new field, definitions are still being debated.

Tyler (1979) puts forward the following definition of videotex and teletext:

> "Systems for the widespread dissemination of textual and graphic information by wholly electronic means for display on low-cost terminals (often suitably equipped television receivers) under the selective control of the recipient, using control procedures easily understood by untrained users."

Using CCITT terminology, 'videotex' - a word that is gaining international acceptance as a synonym for 'viewdata' - is used to denote systems like Prestel that use 'wired' transmission to distribute their signals, while the word 'teletext' is reserved for broadcast systems such as Ceefax and Oracle.

3. IMPLEMENTATION OF VIDEOTEX/TELETEXT SERVICES

These services can be implemented by a variety of different means. Tyler (1979) distinguishes five different categories:

- Narrowband interactive services, known as videotex or viewdata (or occasionally as 'wired teletext') using the telephone system or a similar network to distribute data under the user's control at relatively slow speeds: not more than 2400 bits/sec. This is the concept originated by the British Post Office and now marketed under the name Prestel.

- Broadcast teletext in which textual and graphic information is inserted in digital form into the redundant intervals - the "blanking period" or "vertical interval" - in broadcast television signals, creating a stream of television frames of information from which the user can make his or her selection by keying page numbers which can be obtained from index frames on a printed list. Ceefax and Oracle in the U.K. are both examples of broadcast teletext. This is a one-way service, where the user can select information frames, but does not have a general two-way communication capability.

- Wideband broadcast or cabled teletext (sometimes called cabletext) employing the same principles as Ceefax and Oracle, but achieving much greater capacity by allocating all (or much) of a complete video channel to transmitting the alphanumeric or graphic characters. In principle, an off-air broadcast channel could be used in this way, but a much more likely early application is to cable television. (In France, use of the VHF television channels - which may be vacated by the existing broadcast services in the 1980s - has been suggested for this purpose. Tyler suggests that mobile radio is a more likely contender for any spectrum freed in this way, however.)

- Wideband two-way teletext. In principle, wideband two-way operation would be ideal. It can be achieved on sophisticated switched cable television networks such as that used for the TICCIT experiment in Reston, Virginia, but costs are likely to remain prohibitively high for a considerable period.

- Hybrids among these different approaches. For example, a system with telephone transmission upstream for selection of information frames and cable (or even broadcast) television downstream

for the distribution of the frames themselves might be attractive on theoretical cost and performance grounds, though perhaps ruled out in many countries by commercial and regulatory difficulties. Another interesting hybrid is a partially two-way version of cabletext in which frequently accessed pages are always in the stream sent down the cable, but others are added into the stream in response to users' requirements signalled along the narrowband upstream channels.

4. GLOBAL TRENDS IN VIDEOTEX

Table 1, showing the various countries in which videotex is being developed or investigated, indicates many common trends as well as some significant divergences. In the area of technical standards, Prestel has had an immense influence, but this has not prevented competition between several rival technical approaches involving different and sometimes incompatible standards. Without discussing technical issues in depth, it is essential to include in this general review some technical matters that impinge on any organization offering a videotex service.

4.1 To Prestel or not to Prestel?

The relatively large number of countries which have purchased Prestel software must be due in part to the early lead gained by the BPO. Early purchasers, such as PTTs in West Germany and the Netherlands, saw the merits of purchasing a system that was up-and-running. They were confident that electronic publishing was on its way and felt the need to move quickly to the pilot trial stage. Pressure from teletext and from private electronic publishing interests spurred them along. Although each country is making its own modifications to the system, the resulting services are generally compatible. In other countries, such as Canada and France, telephone companies were busy developing their own systems. In the former case, one result was a system very similar to Prestel, Bell Canada's VISTA, currently the most advanced service in North America. In France the system that has been adopted by the PTT is somewhat different, technically, from the Prestel system and not compatible with it.

The major areas of incompatibility lie in the method of transmission

and the character coding techniques employed. Teletel, the French videotex system, like its sister Antiope, the broadcast teletext system, transmits its signals in a form based on the French "DIDON" Packet Switching standards, the data being transmitted in 'addressed packets' rather than line format. It is claimed that this unification of transmission modes for videotex and teletext leads to greater flexibility and adaptability. But most controversy has raged over character coding; the CCITT study group and the International Standards Organization (ISO) have still not resolved the thorny arguments in this area.

The evolution of teletext to date has parallelled in many ways the evolution of videotex, starting with pioneering innovations by the BBC and IBA, whose Ceefax and Oracle systems have been operating since 1974. Similar systems have emerged in other European countries, while the French have adopted their own different standard for Antiope.

In the United States, experiments with broadcast teletext and both one-way and two-way cable services are operating.

4.2 Technical Trends

While the Europeans (and others) were developing alpha-mosaic systems - that is, systems like Prestel that employ alpha-numeric characters plus graphics built up from a limited number of graphic elements belonging to the same character set as the letters and numbers - the Department of Communications (DOC) in Canada was devising a new system of displaying graphics on the screen. Known by the Canadians - and now the term is gaining widespread acceptability - as 'alpha-geometric', these terminals can handle alpha-numeric or alpha-mosaic material but can also draw graphics, built up from geometric elements (such as line, arc, polygon, etc.) which are transmitted in a compressed coded representation known as Picture Description Instructions (PDI). The DOC system, 'Telidon', also incorporates an even more advanced capability - 'alpha- photographics'. The terminal can display high-definition pictures, element-by-element, wherever the bandwidth of the transmission medium allows the material to be transmitted at acceptable speeds - as could be the case with an optical fibre local transmission system.

In principle, a videotex provider can offer a range of terminals

from simple alpha-numeric, through alpha-geometric terminals with varying levels of resolution, to sophisticated alpha-photographic, and allow the user the choice (although the simplest terminal would not be able to display the alpha-geometric graphics intelligibly).

A number of interesting developments have been stimulated, first by the Information Providers' need for improved editing facilities and second by the requirements of the Prestel business market where there is competition with existing computerized business sytems.

Alternative methods of editing are a special challenge, as the costly and cumbersome aspects of present systems become apparent. The technology developed for the transmission of graphics by Picture Description Instructions (on Telidon) has new counterparts in France and Canada, where a system of drawing on a telewriting pad, with transmission of the signal by 'vectors', is being developed. Philips in Holland are conducting similar work incorporating their existing 'Scribophone' telewriting technology into a viewdata editing system. The Open University's Cyclops system now being developed by INSAC incorporates the most direct method yet - simply drawing on the television screen with a light pen. The constraints on the application of this and other technologies to videotex imposed by narrow band transmission - data transmission speeds of less than 2400 bps - leads one to speculate on the scope for future use of wideband local distribution networks - for example cable or optical fibres. In some countries such as Canada and the United States, cable is quite extensive (over half of all Canadian homes now have Cable TV). On the other hand, though detailed survey data on the matter are not available, it is unlikely that more than a small percentage of the cable plant is suitable for interactive videotex transmission, although high-capacity one-way cabletext (broadband/teletext) is perfectly feasible. Experiments with two-way systems - e.g. the TICCITT experiment in Reston, Virginia have so far proved prohibitively expensive for widespread development. Warner's 'Qube', with its limited 'upstream' capability, may or may not represent a workable compromise solution.

Fibre optics trials are surprisingly advanced in Canada, in Germany and in the U.K., but many of these relate to main-network transmission facilities rather than the essential local link to the subscriber. Only two of these trials, Hi-OVIS in Japan and the Canadian DOC/Manitoba Telephone Company trial, at Elie, Manitoba, incorporate a videotex service.

4.3 Problems and Unknowns

The first problems, all too familiar to those involved in Prestel, relate to terminal supply. It has been difficult to ensure the supply of the limited range of terminals approved for Prestel; the supply of chips for the higher resolution systems is by no means guaranteed. Alpha-geometric terminal chipsets of the kind required for Telidon and similar sytems are being developed in Canada, France and the United States, but the lead time is long; the question is whether the aspiring system suppliers will wait.

Second, there are the unknowns; very little research has yet been completed on the market for videotex. Who will be the users? What information do they want? How do they want it displayed? We are all looking for the answer to these crucial questions. Tyler has suggested that the demand for the higher resolution systems, with their more sophisticated graphics and 'photographic' images, will initially be mainly in the residential market where the emphasis may well prove to be on 'fun' material; browsing, entertainment (e.g. cartoons), and games. The business sector may well be content with less sophisticated graphics capabilities and black and white terminals since these are adequate, familiar, and cost-effective for the more 'utilitarian' information-retrieval applications. One consequence of this hypothesis, if it proves to be correct, might be that the residential market might develop in a 'modular' fashion rather similar to that adopted by the hi-fi market; an early and relatively slow take-up of unsophisticated and possibly relatively expensive sets being followed by

- an increased rate of take-up of first generation sets as they become cheaper
- a demand for more sophisticated capabilities as users become experienced and the range of applications is extended.

This obviously leads one to look to future technical directions. It is becoming more widely recognized that the videotex market is not an isolated one, but that its future will be closely linked to other technological and service developments.

TABLE 1: WORLD VIDEOTEX AND TELETEXT DEVELOPMENT

Country	System name	Operator	Stage of service	Other information	Type
U.K.	Prestel	BPO	Public service from Sept. 1979	Test service has: 130,000 frames, 1500 users, 164 IPs (August 1979)	Videotex
	Ceefax	BBC	Public service since 1978	Estimate mid 1979: 15,000 terminals in use	Teletext
	Oracle	IBA	Public service since 1976		
France	Antiope	TDF	CUG commercial	Bourse - 400 pages. Meteo - 32 pages	Teletext
	Teletel	DGT	Trials to commence Jan. 1980	Ille et Villaine trial - to replace telephone directory. Velizy - 3000 users, 3 service providers	Videotex
Holland	Viewdata	PTT	Business CUG service from July 1979	3 IPs, all using system in-house	Videotex
			Public market trial Aug. 1980	50,000 frames, over 100 IPs, 3000 users	
	Viewdata	VNU	Pilot in-house service from Sept. 1979 Public CUG service from Jan. '80	In-house service - 30-40 terminals	Videotex
Germany	Bildschirm-text	DBP	Market trial from Feb. 1980	Dusseldorf and Berlin. 25 IPs and 3000 users each location	Videotex
	Bildschirm-zeitung	BDZV		News publishers association = BDZV	Teletext
	Videotext	ARD/ZDF (broadcasters)	Test service from Feb. 1980		Teletext
U.S.	Qube	Warner Cable Corp.	Service from Dec. 1977	Interactive. Potential 100,000 users	Cable
	Viewtron	Knight-Ridder	Trial from early 1980	Miami. 150-200 terminals	Videotex
		GTE	Trial date not set	Prestel standards. IPs: publishers and newspapers	Videotex
	Green Thumb	USD A & C	Trial began 1978	Agricultural info. in Kentucky	Videotex
	Infocast	Digital Broadcasting Co.	Operating Dallas, Wash., San Francisco	Info. broadcast via radio waves and then stored; similar to electronic mail	Teletext
		KSL-TV	Service since 1978	Salt Lake City	Teletext
	KMOX-TV	CBS	Service began April 1979	Both Antiope and Ceefax standards broadcast	Teletext
	IDR	Reuters		Info. retrieval for banks, hotels etc.	Cable
	The Source	TCA	Available late 1979	Access to data via telephone and psn Electronic mail facilities Information utility network	Videotex
	Infotext	Micro TV, Inc.			Teletext
Canada	Vista	Bell Canada	Pilot trial from Feb. 1979	30 terminals, both Vista (alpha-mosaic) and Telidon (alpha-geometric)	Videotex
			Market trial mid 1980	1000 terminals. Publishers as IPs	
	Elie	DOC/CTCA	Interactive trial 1981	Fibre optics; 150 users planned	Videotex
	Ida	Manitoba Tel. Sys.	Trials from end 1979	Alarms, videotex. Possible links with Vista Initial 100 terminals	Videotex
		Alberta Gov't Tel.	Pilot trial Sept. 1979 Market trial 1980	Initial 120 homes for videotex, alarms, polling	Videotex
		BCT	Pilot trial in Vancouver, 1980	To include Telidon units	Videotex
		OECA	Experimental April 1979 Trial Autumn 1979	10 terminals Educational. 300 pages. 55 terminals	Teletext
		Grand R'r Cable Co.	Trial Autumn 1979	75 terminals	Teletext
Japan	CAPTAINS	PTT	Trial August 1979	1000 terminals, 100,000 pages. No charge to IPs (newspapers, publishers, stores etc.)	Videotex
	Hi-OVIS	MITI (Trade and Ind.)	Test began July 1978	168 terminals in homes Full two-way interactive; fiber optics	Cable
Belgium	(Viewdata)	BRT	Alternative standards being studied	Flemish speaking BRT more interested in project than French speaking RTB. Want compatibility with Dutch standards	Videotex/ Teletext
Sweden	Datavision	Televerket (PTT)	Limited techifield trial - Mar. 1979	15 IPs, 50 terminals	Videotex
	Text-TV	Sveriges Radio	Field trial early 1979	200 terminals for the deaf	Teletext
Finland	Telset	Helsinki Tel. & Nokia Elec. & Sanoma Pub.	Pilot trial - June 1978 - April 1979	30 users. 1000 page database; business biased	Videotex
Norway	(Viewdata)	PTT	Trial imminent	100 terminals. 10,000 frames. IPs to include gov't agencies and consultancies	Videotex
Spain	(Viewdata)	CTNE	Trial to begin Dec. 1979, for 12 mo.	800 users. Umbrella IPs - "Promotores" - to include publishers, stock exchanges, lawyers. Public service dependent on compatibility with PSN	Videotex
Italy	(Viewdata)	PTT	Official commission studying alternatives; recommendations Sept. 1979	Concessionary company would develop and implement service	Videotex
Hong Kong	(Viewdata)	PTT	Under study	Business service biased. IPs interested	
Singapore				Has purchased Prestel technology	Videotex
Australia		ABC PTT	Under study	U.K. standards have lead, but also considering Jap., French & Canadian. No services yet planned	Teletex Videotex
Switzerland		PTT	Working parties on all aspects	System delivery Sept.; IP assoc. has 40 members	Videotex

5. REACTIONS TO VIDEOTEX AND TELETEXT

5.1 The Carriers

The early take-up of the Prestel challenge by PTTs in Germany, Holland and Sweden and the alternative system being developed in France has already been mentioned. Table 2 shows many European PTTs in varying stages of involvement with videotex. Outside Europe, Hong Kong and Singapore have bought the Prestel software; Japan is developing both narrowband and wideband systems - CAPTAINS and Hi-OVIS respectively. Only in Australia among major market-economy countries is the story entirely negative; a commission which was looking into the development of both broadcast teletext and videotex has been abandoned and the authorities have announced that no service will be offered until an international standard is set.

In the U.S., GTE have bought the Prestel system from INSAC and they plan to have a nationwide service available to business users from the Autumn of this year. This service will be transmitted on TELENET (a Packet Switching network), which has also recently been purchased by GTE.

Other systems are planned in the United States, though as yet GTE's is the only national system known to be in preparation. Knight-Ridder, the Florida newspaper company, have announced their VIEWTRON system, Telecomputing Corporation is offering an information system called 'The Source' which is essentially a videotex service, and recent conferences on videotex in the publishing world indicate widespread interest.

Almost all the major Canadian telephone companies are investigating the possibilities of videotex systems, and coordination meetings have been held. Bell Canada will start the market trial of their VISTA system next year, incorporating the TELIDON technology Manitoba Telephone and Alberta Telephone also have trials in the pipeline and BC Telephone (owned by GTE) are in hot pursuit; - in all eleven experimental videotex services are planned to be operating in Canada by the middle of next year.

This catalogue, though not comprehensive, gives an indication of the widespread support of PTTs and telecommunications carriers for videotex, though all the services mentioned here are in the trial stage (except for Prestel, which is already considered to be an established public service) and much will depend upon the experiences of the pioneers.

5.2 The Manufacturers

The second essential component for the success of videotex and teletext is the support of the television receiver and terminal manufacturers and their component suppliers. The U.K. experience is that the manufacturers have acted very cautiously. Estimates for the number of sets that will be available at any time are constantly being revised downwards. Estimates made by the British Radio and Electrical Manufacturers Association (BREMA) early this year predicted that some 22,000 Prestel equipped television sets would be in use by the end of 1979. The latest forecast from BREMA is that there will be 16,000 British manufacturers' sets at that time, although they add that increased production during the first quarter of 1980 will bring the total to 18,000 sets by March 1980. There is considerable doubt whether these forecasts will be met. The Television and Electrical Manufacturers Association (TEMA) predict that 6,000 business terminals will be produced in the U.K. in 1979. All these figures are based on U.K. production; in September 1979 import restrictions on Prestel sets will be lifted and it is certain that sets will arrive on the market from abroad.

BREMA predicted last year that cumulative teletext sales in the U.K. would reach 250,000 by December 1979, but estimates of the number of sets currently on the market are in the region of 20,000.

The manufacturers' caution is understandable for a number of reasons:

- The market is unknown and unproven.
- The technical standards are not yet set.
- Regulations for the interfaces with telephone networks are complex and changing.
- The development of LSIs is a lengthy and costly process and the semi-conductor manufacturers are under pressure from many sides as the applications for these 'miracle-chips' multiply.
- There is uncertainty about the impact of teletext developments on videotex and vice versa. Especially in countries where rental of TV sets is not prevalent - and that is almost every country except Britain - it is felt that if teletext 'takes off' before videotex gets a hold on the market, then the potential for the sales of new videotex TV sets may be delayed another 3-5 years.

Despite these problems, and the resulting tardiness of the manufacturing industry, there has been considerable confidence shown in videotex around the world: events of the next few months should confirm this more clearly than ever before.

5.3 The Information (Service) Providers

The response to videotex in every country where it has been mooted has been positive. In Britain the rapid growth of interest in the service has led to the present group of 166 more or less active IPs plus 70-80 on a waiting list. In the Netherlands it was pressure from the business community that spurred the PTT to move ahead with its Business Service, and the interest in that system has continued to be encouraging. In Canada the Vista system attracted all the major publishing interests in the Bell Canada Service area of Ontario and Quebec: even before there is a service to offer to the public, the Vista system has 10 very active Information Providers.

Further evidence of the seriousness of IP involvement comes from the formation of Industry Associations, the first of which was the Association of Viewdata Information Providers (AVIP) in the U.K. The concerns of this group, which include relationships between the IPs and the Post Office, codes of practice and standards of behaviour, contracts and copyrights, are already being echoed by groups in other countries and at the time of writing two other associations have been formed - in Switzerland and Canada (the Videotex Information and Service Providers Association of Canada, VISPAC). This development was carried one stage further in early July of this year with the announcement of the formation of an 'International Association of Videotex Information Providers' which is to operate from Switzerland.

Perhaps it is surprising that so great an investment is being made in so unknown a system. A number of factors have contributed to this.

In the world of publishing, the idea of electronic publishing is not new. It is an awareness and a belief among the publishing industry that electronic publishing will come - in one form or another - that has given the incentive to become involved in the early stages of videotex,

to learn about it and exploit its potential. A good example of this is happening here in the U.K. Some newspaper publishers joined Prestel because they saw a need to 'defend' traditional areas of local revenue; this has given way, in at least one case, to active participation in the growth of Prestel on a national scale. Other publishers simply feel the need to defend those areas of revenue that may be threatened by videotex (classified advertisements being the obvious example) while still others have become involved simply because they feel that if they don't jump on the band-wagon now they may be inexorably left behind.

In Canada, three major publishers - Southam Press, the Toronto Star and the Toronto Globe and Mail - have formed a consortium called INFCO to publish electronically on Vista and any other system that may be offered in Canada in future. One of the offerings that may well be linked into videotex through this consortium is the Globe and Mail's InfoGlobe - an advanced, full-text newspaper retrieval service using keyword search procedures. This is an example of a trend which, although it is not yet apparent in Britain, will surely come: the establishment of an interface for external computers, allowing Information Providers to 'hook up' their own computer to the videotex network and give videotex users access to their entire database. One application of this type of interconnection is mail order buying: in Germany great emphasis is being place on the development of an interface for external computers and on the transactional capabilities of the service, partly in response to the interest that has been shown in Bildschirmtext from the outset by the big mail order houses as well as other organizations with 'transaction' services, such as the airlines and railways with their computer reservations systems.

The French PTT are particularly interested in electronic banking facilities on videotex; they have developed an electronic card-reading system that will enable transactions to be completed and bank statements to be updated and read via videotex; the card carries a 'value' which can be reduced or increased by inserting it into the machine. These developments have been welcomed by banks; the electronic delivery of bank statements is particularly attractive because of the cost savings involved.

In the U.K., the emphasis has been on information provision, rather

than transaction services or messaging - although it is only fair to mention that successful transactions using the inputting of credit card numbers are taking place and that limited messaging using Response Frames and the new 'Mailbox' system are popular among IPs and users alike. Early attempts to use the information provision service for the mass entering of train timetables and encyclopaedias lend themselves less well to videotex, in my opinion, than some of the more novel and selective applications. Obviously at this stage it is impossible for me or anyone else to say what will be the 'ultimate' videotex application. Despite the delays which are causing dissatisfaction among British IPs, many organizations continue to show their confidence and to experiment with the medium; but the measure of success or failure awaits the days when large numbers of users will indicate their preferences by pressing the keys.

5.4 The Users

The major question facing the carriers, the manufacturers and the Information Providers alike, is whether or not there will be a demand for videotex and teletext and what the nature of this demand will be. To date this question has not been answered. There are three sources of information about user reaction to videotex and teletex:

- Pre-trial studies assessing the attitude of users towards electronic information retrieval systems.
- User monitoring at present is limited to the market research being conducted on the Prestel operational system .
- Fundamental research on information needs and usage patterns of information media.

Pre-trial studies conducted by Bell Canada, for example, indicate a fairly high level of interest in videotex. Group discussions at which the VISTA system was demonstrated showed high levels of interest in educational applications and in consumer product information in the residential sector. Games and entertainment information came further down the list.

By contrast, emerging Prestel usage statistics show games to be by far the most popular area of the database. Further distinctions between national markets will surely emerge as the systems develop. While the

Canadian and U.K. data are not strictly comparable, having been collected at different stages of videotex awareness, they provide an indication that certain applications which are in demand in the U.K. (games for example) may already be provided for in Canada, by other means, whil[illegible]e greater demand in that country is to supplement educational servic[illegible]o the home.

In response to such evidence, CS&P and others are conducting fundamental research on the information needs of potential videotex users. At CS&P we are carrying out major studies of traditional sources of information and their substitutability by electronic media and of household expenditure on information media, while somewhat related studies of the use of information media are being conducted by the Research Institute of Telecommunications and Economics in Japan.

6. CONCLUSIONS

A review of videotex and teletext indicates widespread interest in these new systems. Although mass demand for electronic information delivery to the residential market has yet to be demonstrated, there is widespread confidence in the business market. Particular sectors of the market emerge as obvious users. A real estate group and a national publishing organization have emerged as the first users of the business closed user group system in the Netherlands. Interest is growing among small businesses where an inexpensive networked information service has attractions, even in the face of competition from specialized 'in-house' systems. Financial and stock-market information is proving adaptable to the new media; on one-way cabletext (e.g. Reuters' Monitor), broadcast teletext (e.g. Antiope-Bourse), and videotex (Prestel and the London Stock Market private system).

Educational applications are being tested and these and entertainment are seen as the 'lead in' to the residential market.

A natural next stage is the integration of videotex with the home computer: once the intelligent terminal is in the home, then videotex will become just one of many communications available to the household. And in the office, videotex is already being used by one Prestel IP to augment the facilities supplied to his outworkers working from home.

At this stage, it is difficult to draw firm conclusions from the

European experience with videotex. The confidence that has persuaded Information Providers, many of them private businesses of moderate size, and the television receiver manufacturers to risk their own resources alongside those of the state-owned PTTs will be thoroughly tested during the next two or three years. In addition to the basic information retrieval service, whose acceptability and commercial viability will be tested in all the trials, the West German trial will test the hypothesis that transaction services such as electronic mail order purchases or travel reservations will substantially enhance the value of the service to users; and the Ille et Villaine trial in France will test the feasibility of using a videotex-based directory service - with potentially large savings in the costs of printing, distribution, and operator services - in order to financially justify free or subsidized provision of user terminals. (The French are planning to replace the printed telephone directory and directory enquiry service with an electronic substitute by 1990. By that date they will have supplied terminals to all 13 million French telephone subscribers.)

Perhaps that note of French confidence in videotex is an appropriate one on which to end this review of the state of the art in 1979. The 'key year' in videotex planning seems to be 1982. Market trials will then be drawing to a close in many countries, and fundamental decisions will be being made about the transition to a public service. There are still many questions, but there is also much activity to indicate that electronic publishing is a medium of the not too distant future.

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